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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/429,262	10/29/1999	HO-JIN KWEON	03364.P021	5716

7590 02/27/2004

BLAKELY SOKOLOFF TAYLOR & ZAFMAN  
12400 WILSHIRE BOULEVARD  
7TH FLOOR  
LOS ANGELES, CA 90025

EXAMINER

DOVE, TRACY MAE

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 02/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/429,262	<b>Applicant(s)</b> KWEON ET AL.	
	<b>Examiner</b> Tracy Dove	<b>Art Unit</b> 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 December 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 October 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>12/16/03</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

This Office Action is in response to the communication filed on 12/12/03. Applicant's arguments have been considered, but are not entirely persuasive. Claims 1-12 are pending.

#### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/12/03 has been entered.

#### ***Response to Amendment***

The declaration under 37 CFR 1.132 filed 12/12/03 does not provide evidence of unexpected results over the Miyasaka '208 reference. The declaration does not state the materials used to produce the graph labeled "Exhibit A". The discharge capacity of the battery containing the coated positive active material will also depend upon the negative active material used, binder amount in the electrodes, along with many other specific elements of the battery. Specifically, the declaration does not state the only difference between the claimed lithium battery and the lithium battery of the prior art is in the coating step of the positive active material (which results in the different discharge capacity values).

Examiner points out that Miyasaka (in combination with Amatucci) is applied to reject claims 1-4 as being obvious. Claims 1-4 do not contain the product-by-process limitation "wherein the positive electrode is formed after the active material particles are coated with the

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metallic oxide". Thus, the declaration showing unexpected results for the coating method does not overcome the obvious rejection of claims 1-4 over Amatucci in view of Miyasaka.

The declaration filed on 6/2/03 under 37 CFR 1.131 has been considered but is ineffective to overcome the WO99/05734 and/or US6,429,766 references. The evidence submitted is insufficient to establish a conception of the invention prior to the effective date of the WO99/05734 and/or US6,429,766 references. While conception is the mental part of the inventive act, it must be capable of proof, such as by demonstrative evidence or by a complete disclosure to another. Conception is more than a vague idea of how to solve a problem. The requisite means themselves and their interaction must also be comprehended. See *Mergenthaler v. Scudder*, 1897 C.D. 724, 81 O.G. 1417 (D.C. Cir. 1897). The translation of the Korean Invention Report submitted in the declaration does not provide full support for the claimed invention. For example, in claim 1 the first, second, sixth and seventh positive active materials listed are not disclosed. Also in claim 1, the metals Co, K, Na, Ca and Sr of the metallic oxide coating are not disclosed. In claims 3 and 11, the Invention Report supports 1-100 nm only. Note in claims 5 and 9 at least the second, third, eighth and ninth positive active materials listed are not disclosed. Also in claims 5 and 9, the metals Co, K, Na, Ca and Sr of the metallic alkoxide/metallic oxide are not disclosed.

Since claims 1-12 are not entirely supported by the Invention Report, the effective filing date is the actual filing date of the application. It is suggested that Applicant amend the claims to create independent claims that are entirely supported by the Invention Report (entitled to date) and to claims that are not entirely supported by the Invention Report (not entitled to date). Examiner points out that the rejection of claims 1-4, 7, 8 and 12 over Amatucci in view of

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Takeuchi teaches and suggests coating a lithium-manganese oxy-fluoride positive active material with aluminum oxide or titanium oxide. Coating a lithium-manganese oxy-fluoride positive active material with aluminum oxide or titanium oxide is not disclosed by the Invention Report and would not appear to be entitled to the effective date.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 9, 10 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Nunome et al., EP 0789410 A1.

Nunome teaches a method of manufacturing a coated positive active material for a lithium battery (page 3, lines 4-7; Figure 1). The positive active material may be  $\text{LiMn}_2\text{O}_4$  or  $\text{LiMnO}_2$  (page 12, lines 15-18). The positive active material has a surface layer of an oxide of Ti, Co, Ni, Sr or La (abstract; page 3, lines 36-39). The titanium content may be 0.1-5.0 wt% (page 6, lines 6-7). The strontium content may be 0.1-10.0 wt% (page 10, lines 48-50). Figure 1 shows the active material particles are coated before formation of the positive electrode.

Thus the claims are anticipated.

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Claims 9-12 are rejected under 35 U.S.C. 102(e) as being anticipated by Miyaki et al., US 6,365,299.

Miyaki teaches a nonaqueous secondary battery comprising a positive electrode and a negative electrode both containing a material capable of reversibly intercalating and deintercalating lithium. A protective layer is provided on the negative electrode and/or the positive electrode. See abstract. The protective layer preferably contains insulating organic or inorganic fine particles and has a thickness of 1-40  $\mu\text{m}$  (1000-40000 nm). The inorganic particles may be oxides, especially those hardly susceptible to oxidation or reduction are preferred. Examples include oxides of sodium, potassium, magnesium, calcium, strontium and aluminum.  $\text{TiO}_2$  is also useful. See col. 2, lines 40-col. 3, lines 14. The protective layer can be formed successively or simultaneously by applying an electrode material mixture onto a current collector (col. 6, lines 47-50). The surface of the oxide as a positive electrode active material can be coated with an oxide having a different chemical formula from the positive electrode active material (col. 16, lines 4-8). Examples of lithium containing metal oxide positive active materials are disclosed in col. 16, lines 26-col. 17, lines 13.

Thus the claims are anticipated.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amatucci et al., US 5,674,645 in view of Takeuchi et al., WO 99/05734.

Amatucci teaches a lithium ion rechargeable battery having a lithium manganese oxy-fluoride positive electrode material. The material has the general formula:



where M is Co, Cr or Fe; and x, y and z are defined as in the abstract. See also Example 1 and Example 9.

Amatucci does not explicitly teach that the lithium manganese oxy-fluoride positive electrode material is coated with a metallic oxide.

However, Takeuchi teaches a positive electrode active material comprising: a positive electrode active material body having a composition  $\text{Li}_{1+x}\text{Mn}_{2-x-y}\text{M}_y\text{O}_4$  wherein M denotes at least one element other than Mn and a cover layer formed on a surface of the positive electrode active material body, the cover layer being composed of a metal oxide. See abstract. Takeuchi teaches it is preferably that the cover layer composed of a metal oxide contains Al or Ti (col. 4, lines 28-30). The electrolyte and the active material are effectively separated by the cover layer, so that it becomes possible to prevent the Mn ion constituting a surface layer of the active material from being dissolved into the electrolyte, whereby a cycle characteristic at high temperature can be maintained (col. 5, lines 26-33). The surface of the active material is epitaxially covered with the metal oxide cover layer (col. 7, lines 22-29). The thickness of the cover layer is preferably in a range of 1-100 nm and completely covers the surface of the active material body (col. 7, lines 57-67). See also col. 9, lines 24-54. The covering material is blended with the active material body then the positive electrode is formed (col. 10, lines 10-21

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and 62-67). Note the Tables contained in Takeuchi (M may be Co, Al or Cr). Takeuchi teaches a lithium manganese cobalt oxide was prepared (col. 14, lines 55-60), then the active material was added to water to prepare a solution. The salts of the metals to be contained in the cover layer are then added to the solution and stirred. The solutions were heated, dehydrated and fired in reflux of oxygen to prepare the active material with cover layer (col. 14, line 61-col. 15, line 2). In the case where materials such as Ti and Sn that are easily hydrolyzed are used, ethyl alcohol was used in place of the water, and isopropyl alkoxides of Li, Mn, Ti and Sc were used (col. 15, lines 3-8). See Examples 22-27, which teach a heating temperature of 300-900 C.

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Takeuchi teaches the positive electrode material of a lithium secondary battery should be coated with a metal oxide cover layer to provide significant effects such that the lowering of the capacity in accordance with the progress of charge/discharge cycles at a high temperature can be effectively suppressed and the lowering of the open-circuit voltage (OCV) and capacity even after the battery is preserved or stored in a high-temperature situation can be also effectively suppressed (col. 2, lines 55-64). Furthermore, the electrolyte and the active material are effectively separated by the cover layer, so that it becomes possible to prevent the Mn ion constituting a surface layer of the active material from being dissolved into the electrolyte, whereby a cycle characteristic at high temperature can be maintained (col. 5, lines 25-33). Also note col. 6, lines 30-54 of Takeuchi. Takeuchi teaches that in order to secure the high temperature characteristics without impairing the capacity characteristics, it is essential that a metal oxide is used as the covering material (col. 6, lines 62-65). Thus one of skill would be motivated to coat the active material of Amatucci with the metal

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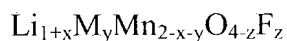
oxide of Takeuchi because lowering of the open-circuit voltage (OCV) and capacity even after the battery is preserved or stored in a high-temperature situation can be effectively suppressed. One of skill would be further motivated to coat the active material of Amatucci with the metal oxide of Takeuchi because it becomes possible to prevent the Mn ion constituting a surface layer of the active material from being dissolved into the electrolyte.

Regarding the "1-20 hours" limitation of claim 8, one of skill would find this limitation obvious since both Takeuchi and the instant claims teach a metal-alkoxide solution that is subjected to a heating temperature of 300-900 C to convert the metal alkoxide to a metal oxide. Thus, one of skill would have known that a time duration similar to that of the instant invention would be required to convert the metal alkoxide solution of Takeuchi to the metal oxide constituting the cover layer.

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Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amatucci et al., US 5,674,645 in view of Miyasaka, US 5,869,208.

Amatucci teaches a lithium ion rechargeable battery having a lithium manganese oxy-fluoride positive electrode material. The material has the general formula:



where M is Co, Cr or Fe; and x, y and z are defined as in the abstract. See also Example 1 and Example 9.

Amatucci does not explicitly teach that the lithium manganese oxy-fluoride positive electrode material is coated with a metallic oxide.

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However, Miyasaka teaches a lithium ion secondary battery having a positive electrode comprising an active material of a lithium transition metal oxide which is coated with a non-electron conductive protective layer. See abstract. The lithium transition metal oxide may have the formula  $\text{Li}_y\text{Mn}_2\text{O}_4$  wherein  $0 < y \leq 1.2$ . The non-electron conductive protective layer that coats the positive active material comprises particles of a metal oxide selected from the group consisting of aluminum oxide, titanium dioxide and zirconium oxide. See col. 3, lines 16-23 and col. 4, lines 1-4. Table 1 lists preferred compositions of the positive electrode active material. Examples of electro-insulative material include alumina (aluminum oxide), calcium oxide, titanium dioxide and magnesia (magnesium oxide). See col. 6, line 59-col. 7, line 10. The protective layer generally has a thickness of 0.5-50  $\mu\text{m}$  (500-50000 nm). See col. 7, lines 40-44.

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Miyasaka teaches the positive electrode of the lithium ion secondary battery should be coated with a non-electron conductive (or electro-insulative) protective layer so that the surface of the positive electrode can be kept from lithium metal dendrite which may be produced on the negative electrode (col. 6, lines 59-64). Thus one of skill would be motivated to coat the active material of Amatuucci with the metal oxide of Miyasaka because any metal dendrites formed can be kept from contacting the positive electrode and creating a short circuit.

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Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nunome et al., EP 0789410 A1.

See discussion of Nunome above regarding claim 9.

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Nunome does not teach the oxide has a thickness range of 1-1000 nanometers.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Nunome teaches the surface layer of the metal oxide has an extremely thin thickness (page 5, lines 44-46). One of skill in the art would have found a thickness of the metal oxide coating of 1-1000 nanometers obvious in view of the teaching by Nunome of a metal oxide surface layer having an extremely thin thickness.

***Response to Arguments***

Applicant's arguments with respect to claims 1-12 have been considered but are not persuasive.

Takeuchi

Applicant argues the declaration under 37 CFR 1.131 establishes an invention date prior to the publication date of Takeuchi (WO99/05734). The 35 U.S.C. 102(a) rejection in view of Takeuchi has been withdrawn.

Fujino

Applicant argues the declaration under 37 CFR 1.131 establishes an invention date prior to the filing date of Fujino (US6,428,766). The 35 U.S.C. 102(e) rejection in view of Fujino has been withdrawn due to the removal of the cobalt oxide coating material.

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Miyaki

Applicant argues Miyaki teaches “a protective layer is provided on the negative electrode and/or the positive electrode” in contrast to instant claim 9 which recites “a metallic oxide coated on each of the active material particles”. However, Miyaki teaches the protective layer can be formed successively or *simultaneously* by applying an electrode material mixture onto a current collector (col. 6, lines 47-50). The surface of the positive electrode material can be coated with an oxide having a different chemical formula from the positive electrode active material (col. 16, lines 4-8).

Amatucci in view of Takeuchi

Applicant argues the declaration under 37 CFR 1.131 establishes an invention date prior to the publication date of Takeuchi (WO99/05734). However, the declaration under 37 CFR 1.131 is ineffective (see above).

Amatucci in view of Miyasaka

Applicant argues the declaration provides evidence of unexpected properties for the claimed invention over the Miyasaka reference. However, claims 1-4 do not contain the product-by-process limitation the “positive electrode formed after coating”.

**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is 571-272-1285. The examiner can normally be reached on Monday-Thursday (9:00-7:30).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in cursive script, appearing to read "Tracy Dove".

Tracy Dove  
Patent Examiner  
Technology Center 1700  
Art Unit 1745

February 23, 2004